

2-1979

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## Recommended Citation

Weisskoff, Richard, "Imports and Import Functions for Brazil, 1953-1970" (1979). *Economic Staff Paper Series*. 157.  
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## **Abstract**

Throughout the postwar period, the Brazilian economy has swung violently through phases which have been described first as the rise and the decline of import substitution, and then, after even more severe economic contraction and political counter-revolution, an explosion of growth known as the "Brazilian miracle." All during this period, Brazil has relied on its exchange markets and protective structure to ration its constricted import capacity among competing users. While other import-substituting countries have turned more exclusively to discretionary quotas and licensing...

## **Disciplines**

Behavioral Economics | Economic History | International Economics | Political Economy

Imports and Import Functions for Brazil, 1953-1970\*

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Richard Weisskoff  
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No. 26

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# Imports and Import Functions for Brazil, 1953-1970\*

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## Introduction

Throughout the postwar period, the Brazilian economy has swung violently through phases which have been described first as the rise and the decline of import substitution, and then, after even more severe economic contraction and political counter-revolution, an explosion of growth known as the "Brazilian miracle."<sup>1</sup> All during this period, Brazil has relied on its exchange markets and protective structure to ration its constricted import capacity among competing users. While other import-substituting countries have turned more exclusively to discretionary quotas and licensing,

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\* This paper was begun in June 1966 and completed in August 1975. In the first phase the author collaborated with Paul G. Clark in a summer research project supported by AID which was subsequently released as Clark and Weisskoff [ 5 ]. In the early phases of this work, I would like to thank Drs. Miranda Altamira of SNR, Cori Acioli of SEEF, Paulo Monteiro of CACEX, and José Bastos Tavora of IBGE for supporting the data seeking and processing. We are also indebted to Dra Maria da Conceição Tavares of CEPAL, Drs. Joaquin Mangia of CPA, Angelo de Souza of FGV, Graciano Sá and Sam Morley, both then of EPEA, and special thanks to Dr. Everaldo da Silva, then of U.S. AID and currently with the BNH.

The updating of the fundamental work could not have been accomplished without the continuing cooperation and encouragement of Dr. Tavora of the IBGE and Paul Clark of Williams College and the patient assistance of Antonio da Cunha and Judy Golden in New Haven, Connecticut, and Juan Allende in Ames, Iowa. These phases were supported by grants from NSF and NBER for Latin American research. None of the views presented here in any way reflect the opinions of the sponsoring agencies.

<sup>1</sup>On the first period, see ECLA [ 7 ]. See Furtado [10] and Stepan [27] on post-1964 growth, especially the chapters by Fishlow [ 9 ] and Cardoso [ 3 ].

Brazil has persistently maintained a complex system of protection based on differentiated tariff and exchange rates. The quantitative record of this system, left in disparate forms and places, provides the raw materials for an unbroken record of the actual price of imports relative to nationally-produced goods.

The econometric study of postwar Brazilian import behavior is of critical interest on at least two accounts. An historical investigation itself provides an important empirical résumé of the Brazilian industrialization experience. Second, the summary estimates of Brazilian import elasticities may assist in anticipating future trade imbalances under different conditions of relative inflation and growth.<sup>2</sup>

The objective of this paper is to estimate the long-run import elasticities for broad use classes of imports, based on the detailed reconstruction of domestic and import price series, the changing tariff structure and variations in the multiple exchange rates. The goal is to specify the concrete quantitative relationship between the disaggregated distribution of imports, their price relative to domestic goods, and the growing national economy. Considering the continuing change in both national industry and imports, can we use such elasticities, estimated on historical data, as a predictor of trade imbalances in the coming decade?

#### I. Imports and the Brazilian Economy, 1948-1971

Despite the grave pressures on the foreign sector, Brazil has achieved steady and impressive rates of real growth in the postwar

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<sup>2</sup>See for example Houthakker and Magee [12], Kreinin [17], and Khan [16].



period with the lone exception of a series of protracted crises in the mid-1960's (see Table 1, col. 1). The precarious imbalance of the trade sector is evident in the wide swings in the annual growth rates of the import capacity (col. 2-3). In both the opening (1948-50) and closing (1966-68) years of the available series, import growth has far outstripped exports, reflecting different compensating mechanisms and their consequences.<sup>3</sup>

The level of openness of the economy has not been measurably reduced since the completion of the initial phases of import substitution (1948-53) when imports had accounted for more than 11% of GDP or around 10% of total supply (col. 4-5). Thereafter, the share of imports to GDP rarely rose above 10% or 9% of total supply, except during the 1963 recession.<sup>4</sup>

The overall import capacity has actually grown more slowly than national income and its components. While the index of import capacity has doubled from 1948 to 1969, the gross national income has nearly quadrupled while its various components, such as capital formation, personal consumption, and industrial output, have risen more than three, four, or five times, respectively (Table 1, col. 6-10).

The differential growth of broad categories of imports testifies to two dimensions of Brazil's industrialization. The absolute decline in the value of imports of consumer durables and capital goods (Table 2, col. 1 and 6) reveals a process of "visible"

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<sup>3</sup>See Weisskoff [28].

<sup>4</sup>The annual fluctuations, disguised in the three-year averages, vary in the early period from 7.2% to 15.1% for M/GDP and from 5.8% to 15.6% for M/total supply. From 1953 to 1969, the first ratio ranges from 7.5% to 12.1% and the second from 5.9% to 9.2%.

import substitution, while the slowly rising growth in the value index of intermediate imports relative to the index of national industrial output (Table 1, col. 8) indicates progress in "relative" import substitution which has proceeded despite increases in the absolute value of imports. The percentage breakdown of imports by use class (Table 2, Panel B) provides a different time profile on the substitution process. The diminished shares of imports of both consumer durables and capital goods reflect the success of domestic replacement activities all during the period and the realistic limits on further reduction of these categories.<sup>5</sup>

The dramatic rise in the import shares of fuels and nonmetallic intermediate materials and a stable share of consumer nondurable imports had, by the early 1960's, provoked the Brazilian economist Maria Conceição Tavares to note, "the maintenance of existing industrial activity itself would remain strategically dependent upon mass imports of raw materials," anticipating the crisis then in progress.<sup>6</sup> In the more recent period, however, the rising share of fuel imports has (until the recent oil crisis) been successfully checked and nonmetallic intermediate imports (mostly wheat, wood, chemicals, fertilizers) stabilized, making room for the recovery in the share of capital goods imports. This increase in the relative importance of capital goods imports has been interpreted as suggestive of a realignment in the international division of labor

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<sup>5</sup> Echoing here the original observation made by ECLA [ 7 ], p. 23-24. Also, see Leff [18] on capital goods. The recently rising share of nondurable consumer imports consists of significant increases in imports of foodstuffs and pharmaceuticals.

<sup>6</sup> ECLA [ 7 ], p. 24.

by which Brazil continues the reproduction of older capital goods, but new machinery, required by the expanding foreign-owned plants and export enclaves, are imported with the assistance of foreign capital.<sup>7</sup>

Despite the slow relative growth of overall imports, the critical links between certain key imports and domestic consumption, once harshly criticized as evidence of continuing dependence, may have been rendered slightly more circuitous by the extensive substitution process but are still unbroken. That automobiles are assembled in Brazil with Brazilian-made parts has not reduced the necessity for copper imports; that bakery ovens are cast in Brazil with domestic iron in no way has reduced the need for imports of metallurgical coal or of wheat, for that matter. Rather, it is the combination of recent export success and heavy capital inflows which allow greater slack in the import process and permits current observers to ignore the continuing underlying vulnerability of the economy to critical import streams.<sup>8</sup>

## II. The Demand for Imports: Models and Data

Two standard import models will be fitted to the Brazilian experience. The log-transformations (equation 1) assume a multiplicative interaction between the independent variables, while the linear form (equation 3) assumes directly additive effects.

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<sup>7</sup>See Cardoso [ 3 ].

<sup>8</sup>For more extensive discussion of relative and absolute import displacement on a sectoral and product level and a review of the recent literature, see Weisskoff [28].



$$[1] \quad M_{jt} = A \cdot K_t^{\alpha_{1j}} \cdot P_{jt}^{\alpha_{2j}} \cdot e^{\alpha_{3j}\tau} \cdot w_{jt}$$

$$j = 1, \dots, 9 \text{ and } t = 1953, \dots, 1970.$$

Where  $M_{jt}$  is merchandise imports for nine use classes in current dollars;  $K_t$  is gross capital formation given in billions of constant 1953 cruzeiros (Cr\$);  $P_{jt}$  is the ratio of the import price index to the domestic price index explained below;  $\tau$  is a time trend variable, 1953 = 1, and  $w_{jt}$  is the error term assumed to be log-normally distributed with zero mean and unit variance.  $\alpha_{1j}$  and  $\alpha_{2j}$  are the elasticities of imports for the  $j$  use classes with respect to capital formation and price, respectively, and  $\alpha_{3j}$  is the percentage change in imports with respect to time, a measure of the import substitution trend.

The untransformed or direct form is based on a strictly additive relationship:

$$[2] \quad M_{jt} = \beta_{0j} + \beta_{1j}K_t + \beta_{2j}P_{jt} + \beta_{3j}\tau + v_{jt}, \text{ where } \beta_{0j} \text{ is a constant; } \beta_{1j}, \beta_{2j}, \text{ and } \beta_{3j} \text{ are coefficients of capital formation, price and time, respectively. The error term, } v_{jt}, \text{ is assumed distributed normally with zero mean and unit variance.}^9$$

The inclusion of relative prices and income in the traditional model of both overall and disaggregated import behavior may, at first sight, appear redundant. In the disaggregated formulation of import demand, inclusion of the price variable makes intuitive sense since a complicated system of multiple and varying exchange rates and auctions had in fact served to distribute the reduced

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<sup>9</sup> Imports for the nine use classes ( $M_{jt}$ ) are based on a sample of 472 commodities maintained by the IBGE following a methodology initiated by ECLA [ 7 ].

import capacity among priority needs during periods when export earnings coincided with domestic expansion. (See Kafka [15].)

If the relative price does serve to allocate imports between different use categories, then of what significance is the price elasticity of overall import demand? In view of the variability of inflows of direct foreign investment, we know that the connection between the ability to import and lagged export earnings may be neither as mechanical nor as rigid as supposedly in the early ECLA model. In the most recent period, Brazil has proved successful in obtaining generous balance-of-payments loans and receptive to foreign capital flows. Therefore, we expect that the price elasticity of overall imports reflects the general responsiveness of the preference for foreign imports and their general competitiveness with domestic supply.

The variable,  $P_{jt}$ , is constructed to represent that price which a Brazilian importer must pay for a commodity comparable to and competitive with domestic goods. The actual dollar price of imports relative to inflating domestic prices is traced to several factors: (1) Variations in the rate of exchange between the cruzeiro and different foreign currencies specifically to be used for the importation of different categories of goods. (2) Shifts in the classification of goods between exchange categories depending on their administrative priority. (3) Changes in the ad valorem tariffs on specific and broad groups of commodities throughout the period. If we are willing to assume stable CIF import prices in dollars, then the fluctuations in the cost of each imported commodity can be attributed directly to changes in the relevant exchange rate, shifts in

commodities between exchange categories, and changes in the tariff rates and their exceptions. This comprehensive tariff-plus-exchange premium which an importer must pay over and above the cruzeiro price of a duty-free good purchased at the basic exchange rate is here called the "combined rate of protection."<sup>10</sup>

The annual combined rate of protection, the tariff plus exchange premium, for each of 472 commodities,  $(1 + \omega)_{it}$ , is the basic element in the compound of the import price and the price variable. Building upward, the combined rates of protection for each commodity are weighted by the basket of 1962 imports,<sup>11</sup>  $m_{i62}$ , to yield the combined rate for each of the nine use classes,  $(1 + \Omega)_{jt}$ :

$$[3] \quad (1 + \Omega)_{jt} = \frac{\sum m_{i62} (1 + \omega)_{it}}{\sum m_{i62}}, \text{ where } i = 1, \dots, 472;$$

$$j = 1, \dots, 9;$$

$$t = 1953, \dots, 1970.$$

<sup>10</sup>For more on the exchange rate system, see Kafka [15], Huddle [14], Clark-Weisskoff [5], and the Appendix Tables to this paper available on request. During the period studied here, the exchange categories have been reduced from five to two and then finally to a single import rate, while both the level and variation of tariffs have also been reduced.

In our 1967 paper, Clark and I had called the tariff-plus-exchange premium the "effective rate of protection." Since our original term has come to denote the total levels of direct and indirect protection in the input-output sense, I have avoided its use here.

An improvement in the methodology outlined here may be made by taking into account variations in transport rates, changes in the wholesale prices of imported goods, and the differential application of port and excise charges during the period.

<sup>11</sup>The issues involved in selecting one or several bases for an import index are similar to those faced in constructing any aggregate index during a period of rapid changes in composition and growth. The year 1962 was chosen as a representative middle year of somewhat normal import flows.



The import price index,  $(P_m)_{jt}$ , can then be constructed as the ratio of the average cruzeiro cost of a dollar's worth of imported goods in each use category for each year, relative to the index of domestic prices,  $P_d$ , of a similarly-weighted bundle of competitive goods.<sup>12</sup>

The combined rate of protection,  $(1 + \omega)_{it}$ , is composed of several molecules. One of these, the average tariff,  $\theta_i$ , for each commodity and in each year is built from the unweighted average of items and subitems,  $\theta_k$ , in the tariff schedule. A second major molecule, the exchange rate for importing each sample commodity for each year,  $E_{it}$ , is calculated as the unweighted average of the exchange rates which apply to the constituent items and subitems,  $\epsilon_{ki}$ . In practice, importers did not even pay the item tariff,  $\theta_k$ , on the cruzeiro import price. Rather, the tariff was actually applied to the cruzeiro value of the import converted at an altogether different exchange rate called the "fiscal dollar,"  $\phi$ , which generally lagged behind the current basic exchange rate.

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<sup>12</sup> Domestic price indices for four use classes were constructed by weighting the 87 annual wholesale price series for competitive goods by the corresponding imports in 1962:

$$[3'] (P_d)_{jt} = \frac{\sum_{i=1}^{87} m_{i162} P'_{it}}{\sum_{i=1}^{87} m_{i162}}, \text{ where } i = 1, \dots, 87 \\ j = \text{use classes } 1, 3, 4, 5.$$

and  $(P_d)_{jt}$  is the domestic price index for use class  $j$ ;  $P'_{it}$  is the domestic price of commodity  $i$  in year  $t$ , weighted by  $m_{i162}$ , commodity imports in 1962. Wholesale prices indices for the remaining five use classes co-respond to official FGV series which most closely represent competitive domestic supply.

Thus:

$$[3] \quad \theta_i = \frac{\sum_k \theta_{ki}}{n}, \quad k = 1, \dots, n$$

$$i = 1, \dots, 472$$

where  $n$  varies from one to twenty and  $\theta_i$  is the average commodity tariff "adjusted" for administrative decrees or waivers.

$$[4] \quad E_i = \frac{\sum_k \epsilon_{ki}}{n}, \quad k = 1, \dots, n$$

$$j = 1, \dots, 9$$

$$i = 1, \dots, 472.$$

where the item exchange rates,  $\epsilon_{ki}$ , consist of five "category" rates from 1953 to 1957 and two from 1958 to 1966. Additional exchange rates applied to wheat, petroleum, newsprint, fertilizers, insecticides, fruits and auto chassis during different periods.

The combined rate of protection on each commodity, expressed as a percentage of its dollar CIF price and relative to a tariff-free good entering at the basic rate, is:

$$[5] \quad (1 + \omega)_i = \theta_i \frac{\phi}{\rho} + \frac{E_i}{\rho}, \quad \text{for } i = 1, \dots, 472$$

$$t = 1953, \dots, 1970.$$

where  $\theta_i$  is the commodity tariff rate;  $\phi$  the "fiscal dollar" rate,  $E_i$  the exchange rate at which foreign currency was bought to import commodity  $i$ , and  $\rho$  the basic exchange rate.

The series of annual commodity ratios,  $[\phi/\rho]$  and  $[E_i/\rho]$  were calculated first so that changes in the commodity-tariff,  $\theta_i$  could be isolated as well. Thus a commodity characterized by a zero tariff and subsidized exchange rate,  $E_i < \rho$ , was imported under a "negative" rate of protection relative to another tariff-free good brought in at the basic exchange rate,  $E_i = \rho$ . (See Appendix Tables for these ratios.)



To conclude, the import price index for each use class,  $(P_m)_{jt}$ , is the product of the index of the combined rate of protection,  $\Omega_{jt}$ , (from equation 3), and the index of the basic exchange rate,  $\rho_{jt}$ , for the corresponding use class and year, all relative to the 1953 base year. The final price variable,  $P_{jt}$ , is the ratio of the indices of import and domestic prices, which is in fact calculated as the index of combined protection, the first factor,  $\Pi_{jt}$ , to a second factor,  $V_{jt}$ , the index of the basic exchange rate divided by the index of domestic prices for each use class.<sup>13</sup>

$$[6] \quad P_{jt} = \frac{P_m}{P_d}_{jt} = \frac{(1 + \Omega)_{jt}}{(1 + \Omega)_{j53}} \cdot \left[ \frac{\rho_{jt}}{\rho_{j53}} + \frac{(P_d)_{jt}}{(P_d)_{j53}} \right] = [\Pi_{jt}] [V_{jt}]$$

$$j = 1, \dots, 9$$

$$t = 1953, \dots, 1970.$$

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<sup>13</sup> Each of the above steps could also have proceeded under different assumptions, leading to different estimates. Although commodity tariffs have been adjusted for across-the-board waivers, numerous other exemptions abound, especially those negotiated for LAFTA transactions and for specific projects and agencies. The tariffs estimated here thus represent the posted or anticipated premium which the importer generally expected to pay on buying abroad rather than locally.

Since large quantities of exempt imports did enter during this period, the duties actually collected represent but a fraction of those which might have been expected from the hypothetical application of the synthetic use-class tariff,  $\theta_j$ , which itself is a weighted average of commodities and a simple average of tariff items. Morley [21], basing new calculations on my original worksheets, reduced this aggregated or "posted" tariffs by a fraction to correspond to the annual tariff rate paid on actual imports. Such downward adjustment in the aggregate tariff by iterative reconciliation with collected duties may under-estimate the a priori or expected price of imports relative to competitive domestic goods Bergsman and Malan [2], in following Morley, have made other adjustments for domestic excise taxes.

### III. Results<sup>14</sup>

The estimated import elasticities from the double-logarithmic model (Equation 1) are presented in Panel A of Table 3. The estimates of  $R^2$  indicate acceptable fits with the exceptions of imports of fuel (to be discarded) and capital goods for agriculture. The low Durbin-Watson statistic in the first four equations (total imports and the three groupings of consumer goods) may be caused by the omission of dynamic factors noted by Houthakker-Magee [12], such as the more complete specification of a habit formation model. The import substitution process in the early time period may explain the positive serial correlation in the error term, especially strong in the case of consumer goods, while a more volatile stock adjustment model may be appropriate for most of the remaining classes of imports in view of the high D-W statistics.

Of the eleven equations estimated in Panel A, the income (or more accurately, capital formation) elasticities are significant in six instances and range from 1.80 for overall imports to 5.52 for imports of capital equipment for transportation. The price

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<sup>14</sup>The sheer discovery of different data fields and the coordination of their reconciliation proved a very real adventure through the numerical and organizational labyrinth of 18 years of Brazilian import policy. Sifting through the mazes of statistical information for the weekly saga of exchange rates took this investigator to the subterranean vaults of the Superintendency of Money and Credit (SUMOC) in the Banco do Brasil and high-rise offices of the Council on Tariff Policy (CPA) of the Finance Ministry for chronicles of tariff changes and exemptions. The commodity import series in constant and current values was provided by the IBGE Statistical Laboratory and domestic commodity prices by the Getulio Vargas Foundation. The enormous number of arithmetic operations were performed by the author on the Univac computer at the Praia Vermelha facility of the Brazilian Census Bureau with programming assistance provided by the Finance Ministry's Statistical Service (SEEF). The actual data gathering and the organization of its processing by this investigator could not have proceeded without the full collaboration, however skeptical, of many agencies and individuals in this otherwise intractable research endeavor.



elasticities are almost all significant of the correct sign, and inelastic, with the exception of the nearly unitary elasticities for consumer nondurables and construction materials.

The coefficient of the time trend is both significant and negative for the overall import equation, indicating an annual decline in imports of 8.5% during the total period. The especially high time-elasticities for consumer durables, construction materials, and the three categories of capital goods reflect the high growth rates of the domestic substituting industries.<sup>15</sup>

The weighted sum of the income elasticities (fuels excluded) in Panel A equals almost precisely the income elasticity of the overall import equation. The weighted sum of the price elasticities yields a value slightly higher than the price elasticity for the total imports which might be due to the wide fluctuations of a number of important components.

Of the coefficients of the untransformed variables presented in Panel B of Table 3, most all the estimates of capital formation variable are significant (except for nonmetallic intermediate), the price coefficients of the correct sign, and the time trend negative. The substitution of the variable "GDP generated by industry" in place of capital formation in the metallic intermediate equation (line 15b) yields a significant coefficient, and its inclusion

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<sup>15</sup> The regression of capital goods imports on gross capital formation would lead us to expect obvious collinearity between the independent variable and the error term unless capital goods imports compose but a small and differently fluctuating component of total capital formation. This may, in fact, be true since the equation compares imports of capital goods to the sum of residential construction and the domestic capital goods industry which comprise the dependent variable.

corrects for the negative serial correlation of the error term. The substitution of "new construction permits" in the construction materials equation (line 17b) results in an inferior fit but a similar reversal in the direction of the serial correlation as well. Such changes may be expected to occur if these alternative variables follow, rather than precede, the swings in the Brazilian import cycle.

The capital elasticities derived from the untransformed form are almost identical to those estimated in the log-log forms (Table 4, Panels A & B); the derived price elasticities, however, are all generally weaker. Both sets of import elasticities compare favorably to the earlier Clark-Weisskoff estimates of the untransformed model (Panel C), although the earlier capital elasticities are less elastic, the price elasticities stronger, and the time trend weaker than the updated coefficients.<sup>16</sup>

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<sup>16</sup>No significance tests on the differences between the two sets of coefficients have been undertaken; the earlier estimates refer to a shorter time period and some of the original income data have since been revised.

These earlier elasticities had been used in 1965 to forecast imports for 1970 under differing expectations of growth and tariff liberalization. (See Clark and Weisskoff [5], pp. 20, 55-57.) One set of projections which had assumed a 7% growth rate, lower tariffs, and continued import substitution (realistic possibilities even then) underpredicted the real import level by only 12%. Imports of fuels had been underestimated by less than 9% and metallic intermediate goods by less than 4%. More serious underforecasts for imports of consumer goods, nonmetallic intermediate and construction materials may reflect misspecification of these equations or difficulties encountered in the import substitution process in the most recent years. Minor overpredictions of imports of wheat and capital equipment for agriculture and transport may be due to unexpected gains of aggressive domestic industry or due to the receptiveness of Brazil to international capital in these areas.

The retrospective success of import forecasting on the basis of the earlier sets of elasticities reflects both the continuity of the underlying structure and the budget-like constraint imposed on imports as a whole, at least during the earlier time period. Perhaps the study of import demand elasticities with proper attention to price and import-substitution effects may prove as fruitful an area of research as the study of expenditure patterns elasticities-- and more useful in the formulation of relevant policy.<sup>17</sup>

#### IV. Conclusions

The usefulness of import elasticities in the prediction of trade imbalances relies on the symmetry of both import and export elasticities taken together and on the assumptions of rates of growth and inflation in both Brazil and her trading partners.<sup>18</sup>

The comparison of the overall import elasticities estimated here with the export elasticities estimated by Houthakker and Magee (Table 5, lines a-c) forecasts an unlikely prospect for balanced trade even if Brazil's rates of growth and inflation diminish to equal those of the rest of the world.<sup>19</sup> If the "Brazilian miracle"

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<sup>17</sup> Houthakker and Magee in a comparable model and time period for United States imports found a slightly lower long-run income- and a higher price-elasticity for overall imports (compare Table 4, Panel A and D, line 1). While the differences between the two nations' economies are indeed vast, the income coefficient for consumer durables, the price coefficient of consumer nondurables, and both coefficients for nonmetallic intermediate goods, are strikingly alike.

<sup>18</sup> "The export equations are not without interest," Houthakker and Magee [12] wrote somewhat hyperbolically, p. 118. See also Khan [16].

<sup>19</sup> Khan's income elasticities of demand for imports are lower and his price elasticities higher than those estimated here. However, Khan, in following the Houthakker-Magee procedure, has taken no account of changing tariffs and exchange rates in any of the price variables.



does continue, then even the selection of a conservative income elasticity would lead to the prediction of dire stress on the balance of payments. Recently such trade imbalances have been offset by large inflows of foreign capital. Another alternative, increasingly unlikely with rising petroleum costs and a disastrous coffee harvest, is to revitalize import-replacing policies with a special focus on fuels, foodstuffs and capital equipment, and turn consciously toward a regime of greater self-reliance, both in terms of material and financial inflows.

Figure 1  
Imports, Relative Price, and Capital Formation  
Brazil, 1953-1970

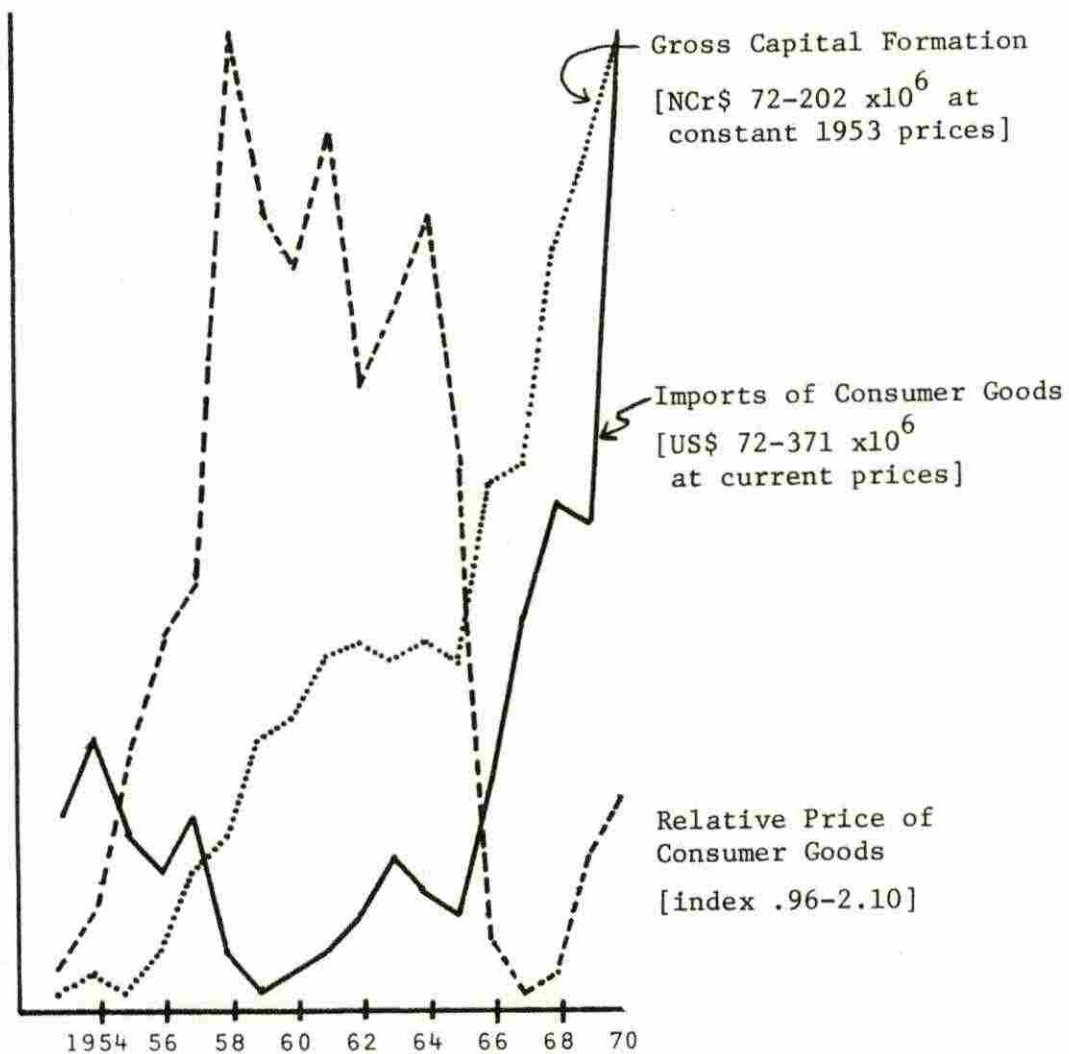


Table 1  
Brazilian Economic Growth and Imports, 1948-71

	Average of Annual Growth Rates			Indices of National Production (1948=100)						
	GDP/capita	Exports <sup>d</sup>	Imports	Average Import Coefficient		National Income	Personal Consumption	Industrial Output	Capital Formation	Import Capacity
				M/GDP	M/supply					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1948-50	4.4	14.7	23.3	11.4	8.8	109	109.5	111.0	108.1	108
1951-53	3.0	-8.7	-2.8	11.4	10.3	135	135.7	138.8	141.8	124
1954-56	3.6	-8.7	1.4	8.5	6.6	165	167.8	177.5	138.9	133
1957-59	4.0	4.2	9.7	8.5	6.5	198	197.9	233.5	176.0	131
1960-62	5.1	2.3	-5.4	8.7	6.7	250	252.5	317.0	211.0	145
1963-65	-0.5	7.2	4.1	9.2	7.0	279	282.0	350.6	214.3	163
1966-68	3.4	4.9	10.3	8.8	6.5	320	331.6	413.6	276.2	184
1969-71 <sup>a</sup>	6.8	-	-	-	-	-	-	536.0 <sup>e</sup>	-	-
1969	7.3 <sup>c</sup>	-	-	9.7	7.0	377	390.2	507.7	338.2	214
Total Period: <sup>b</sup>	3.85	4.5	5.8	9.5	7.5	-	-	-	-	-

Notes: (a) Data for 1971 are preliminary estimates;  
(b) for col. 9-15, average annual growth of index, 1948-69;  
(c) 1971 alone;  
(d) "capacity to import";  
(e) 1969-70 only.

Sources: Col. (1-3): National Accounts in constant 1953 prices are found in IBGE, *Retrospectivas*, pp. 215-6, 1948-62, IBGE, *Anuario 1973*, pp. 564-6, for revised series, 1963-71.  
Col. (4-5): Total supply is the sum of imports and GDP.  
Col. (6-10): National accounts expenditures were indexed to 1948 and averaged.

Table 2

Brazilian Imports by Major Use Categories for 1948-70  
(in constant prices of 1955)

	Indices of values of imports, three-year averages (1948 = 100)					
	Consumer Goods		Fuels & Lubricants	Raw Materials & Intermediate Products		Capital goods
	Durable	Non-durable		Metallic	Non-metallic	
	(1)	(2)	(3)	(4)	(5)	(6)
1948-50	87.9	104.9	110.7	132.3	115.5	102.9
1951-53	103.6	146.7	174.2	191.1	162.6	165.4
1954-56	26.6	124.4	213.4	208.6	163.3	92.6
1957-59	27.8	92.8	210.1	153.9	151.6	135.7
1960-62	17.7	119.3	255.9	193.6	179.0	110.6
1963-65	11.8	139.5	275.9	221.1	165.8	61.6
1966-68	17.6	230.6	318.4	215.4	220.9	76.4
1969-70	27.6	247.9	377.5	309.9	284.3	137.6
Sample Total	(7)					(7)
						107.6
						160.2
						128.8
						136.6
						142.9
						125.9
						157.9
						212.9
B. Percentage shares of imports of use categories						
1948-50	8.1	7.3	13.4	8.4	25.1	37.7
1951-53	5.8	6.9	14.9	8.4	24.4	39.6
1954-56	2.0	7.3	21.9	10.8	29.9	28.0
1957-59	2.0	5.1	20.0	7.8	26.1	39.0
1960-62	1.2	6.3	23.3	9.4	29.4	30.4
1963-65	.9	8.4	28.9	11.9	31.1	18.8
1966-68	1.1	11.0	26.5	9.6	32.8	19.0
1969-70	1.4	8.8	23.1	10.1	31.4	25.4
Sample Total						100
						100
						100
						100
						100
						100
						100
						100

Sources: 1948-60; from ECLA (1964), Table 9A, p. 22.  
1961-70; from ECLA sample provided the author.



Table 3  
Comparisons of Import Coefficients and Elasticities for Brazil

A. Brazil, double-logarithmic form, annual data, 1953-71

	Constant	Elasticities		Time	$\bar{R}^2$ (S.E.E.)	D.W. (F-Stat.)
		Capital Formation	Price			
	(1)	(2)	(3)	(4)	(5)	(6)
1. Total Imports	-3.06 (.29)	1.80* (7.10)	-.42* (5.46)	-.085* (5.75)	.900 (.0747)	1.55 (51.52)
2. All Consumer Goods	-.48 (.16)	1.29 (1.83)	-1.01* (5.36)	-.039 (.953)	.739 (.209)	1.11 (17.02)
3. Consumer Nondurables	1.36 (.41)	.79 (1.01)	-1.08* (5.25)	-.0026 (.0571)	.724 (.233)	1.00 (15.89)
4. Consumer Durables	-9.39 (3.14)	3.04* (4.28)	-.82* (3.85)	-.17* (4.09)	.692 (.211)	1.77 (13.71)
5. Fuels	5.61* (39.49)			.0067 (.3601)	.054 (.107)	.77 (0.13)
6. Metallic Intermediate Goods	-.42 (.14)	1.17 (1.61)	-.74 (4.10)	-.033 (.760)	.760 (.216)	2.20 (18.96)
7. Nonmetallic Intermediate Goods (excluding wheat)	1.23 (.46)	1.04 (1.64)	-.63* (3.06)	-.043 (1.142)	.663 (.188)	2.41 (12.14)
8. Construction Materials	-5.81 (1.49)	2.39* (2.59)	-1.26* (4.16)	-.15 (2.89)	.714 (.255)	2.25 (15.12)
9. Capital Goods for Agriculture	6.57 (1.75)	2.54* (2.84)	-.68* (2.28)	.12 (2.35)	.436 (.266)	2.81 (5.37)
10. Capital Goods for Industry	-7.87* (4.48)	3.17* (7.64)	-.47* (2.60)	-.15* (6.20)	.891 (.121)	1.81 (47.29)
11. Capital Goods for Transportation	18.34* (4.23)	5.52* (5.40)	-.46 (1.14)	-.32* (5.59)	.633 (.295)	2.07 (10.78)

B. Brazil, direct linear form, annual data, 1953-71

12. Total Imports	186.90 (.72)	23.09* (9.10)	-248.78 (2.28)	-111.56* (-6.53)	.929 (114.4)	2.07 (75.58)
13. All Consumer Goods	25.23 (.42)	2.83* (4.12)	-71.33* (3.27)	-12.08 (2.50)	.791 (33.02)	1.75 (22.43)
14. Fuels	125.00* (3.89)	2.04* (4.36)	Domestic Oil Prod.	-.032* (4.14)	.501 (19.66)	1.36 (9.53)
15. Metallic Intermediate (a) Goods	34.85 (.72)	1.99* (3.75)	-70.09* (3.31)	-6.73 (1.83)	.842 (25.81)	2.30 (31.29)
		GDP-Industry				
	(b)	121.60 (2.91)	.48* (4.57)	-83.22* (3.51)	-- (29.99)	1.87 (32.45)
16. Nonmetallic Interme- (a) diate Goods (excl. wheat)	275.2 (1.69)	2.75 (1.81)	-177.39 (2.12)	-9.75 (0.93)	.631 (73.53)	2.53 (10.69)
	(b)	181.3* (4.04)	-- --	15.48* (3.74)	.433 (91.18)	1.91 (13.97)
17. Construction Materials(a)	18.94 (.51)	1.41* (4.46)	-40.46 (2.53)	-8.51* (4.29)	.801 (13.34)	2.21 (23.75)
		Cnstn. Perm.				
					.665	1.83



Table 4  
Comparison of Import Elasticities by Use Class for Brazil and the U.S.

	A. Brazil 1953-70 (log-log)				B. Brazil 1953-70 (direct) <sup>a</sup>				C. Brazil 1953-65 (direct) <sup>a</sup>				D. United States 1947-66 (log-log)			
	Elasticities		Trend (%)		Elasticities		Trend (%)		Elasticities		Trend (%)		Elasticities		L-R Elasticities	
	Capital Formation	Price	Time		CF	P	T		CF	P	T		Y	P		
1. Total Imports	1.80*	-.42*	-8.39*		1.75°	-.20	-7.08°		.95*	-.36*	-3.50*		1.42	-		
2. All Consumer Goods	1.29	-1.01*	-3.89		2.34°	-.72°	-8.38		.30	-.93*	-.58		-	-		
3. Consumer Non-durables	.79	-1.08*	-.26		-	-	-		-	-	-		1.28	-1.40		
4. Consumer Durables	3.04*	-.82*	-17.01 <sup>b</sup>		-	-	-		-	-	-		2.63	-4.05		
5. Fuels	-	-	dom. oil <sup>b</sup> .007		.93°	-	dom. oil <sup>b</sup> -.003°		.52*	-	dom. oil <sup>b</sup> -.21*		-	-		
6. Metallic Intermediate	1.17	-.74*	-3.26		1.78°	-.56°	-5.03		1.96*	-1.24*	-4.48*		1.11	-1.83		
7. Non-Metallic Intermediate	1.04	-.63*	-4.31		1.00°	-.55	-2.97		.74*	-.46*	-3.09*		.30	-.21		
8. Construction Materials	2.39*	-1.26*	-14.62*		2.88°	-.81	-14.57°		1.33*	-1.62*	-8.18*		.61	-.18		
9. Capital Goods: Agriculture	2.54*	-.68*	-12.23		2.10°	-.04	-9.91		1.81*	-.81	-7.35		-	-		
10. Capital Goods: Industry	3.17*	-.47*	-14.71*		2.96°	-.02	-11.45°		1.68*	-.35	-5.97*		-	-		
11. Capital Goods: Transport	5.52*	-.46	-32.16*		3.34°	-1.08	-17.75°		2.08*	-	-12.10*		-	-		

Sources: Panel A: Table 1.

B: Derived from Table 2.

C: Clark-Weisskoff [5], Table C-4B, p. 54.

D: Houthakker-Magee [12], Table 6, p. 121. "Manufactured foods" corresponds to consumer non-durables; "finished manufactures" to consumer durables; "semi-manufactures" to metallic intermediate goods; "crude foods" and "crude materials" to non-metallic intermediate goods.

Notes: \*Indicates 95% level of significance of direct estimates.

°Indicates 95% level of significance of original coefficients only.

a. Calculated at means of variables.

b. Elasticity of fuel imports with respect to domestic oil production.

Table 5  
Summary of Overall Trade Prospects for Brazil

		<u>Elasticities</u>			<u>Source and Technique</u>
		<u>Income</u>	<u>Price</u>	<u>Time</u>	
Imports, 1953-70	(a)	1.80	-.42	-.085	This report, log-log form
1953-67	(b)	.95	-.36	-.035	Clark-Weisskoff, direct form
Exports, 1951-66	(c)	.34	-.39	-	Houthakker-Magee, log-log

Sources: lines a-b from Table 4 above.  
line c from Houthakker-Magee [12], Table 3, p. 115.

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